Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–V • EXAMINATION – WINTER • 2014**

**Subject Code: 151601** **Date: 26-11-2014**

**Subject Name: Computer Oriented Statistical Methods**

**Time: 10.30 am - 01.00 pm** **Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

**Q.1** **(a)** Define Truncation error, Round off error, Inherent error. **07**
Find the relative error and percentage error if 0.005998 is truncated to three decimal digits.

**(b)** Show that the Successive approximation method is linearly convergent. **07**

**Q.2** **(a)** Find all the roots of the equation $x^3 + x^2 - x + 2 = 0$ using Lin-Bairstow method. Start with the initial factor $x^2 - 0.9x + 0.9$ **07**

**(b)** Find all the roots of the equation $x^3 - 2x^2 - 5x + 6 = 0$ using Graeffe's method squaring thrice. **07**

**OR**

**(b)** Solve the non linear system of equations $xy = 1,\ x^2 + 4y^2 = 5$ using Newton-Raphson method. **07**

**Q.3** **(a)** Derive the Recurrence relation for Chebyshev polynomials and using it define $T_2(x)$, $T_3(x)$ and $T_4(x)$ **07**

**(b)** Derive Lagrange's interpolation formula and using inverse interpolation find the value of $x$ corresponding to $y = 12$ from the following data **07**

| x | 1.2 | 2.1 | 2.8 | 4.1 | 4.9 | 6.2 |
|---|---|---|---|---|---|---|
| y | 4.2 | 6.8 | 9.8 | 13.4 | 15.5 | 19.6 |

**OR**

**Q.3** **(a)** Obtain the cubic spline for every subinterval from the following data **07**

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| f(x) | 1 | 2 | 5 | 11 |

**(b)** The pressure and volume of a gas are related by the equation $pV^a = c$. Fit this curve to the following data **07**

| p | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
|---|---|---|---|---|---|---|
| V | 1.62 | 1.00 | 0.75 | 0.62 | 0.52 | 0.46 |

**Q.4** **(a)** Solve $\frac{dy}{dx} = 2y + 3e^x$ with $y(0) = 0$ for $x = 0.1,\ 0.2,\ 0.3$ by Taylor's series method. Extend the solution to $x = 0.4$ by Milne's method. **07**

**(b)** Solve $\frac{dy}{dx} = xy + y^2$ with $y(0) = 1$ for $x = 0.1, 0.2, 0.3$ by Runge-Kutta method. **07**

**OR**

**Q.4** **(a)** Derive the formula of Simpson's 1/3rd rule and use it to evaluate $\int_0^6 \frac{1}{1+x}\,dx$. Hence obtain the value of $\log_e 7$. **07**

**(b)** Explain ill conditioned system of equations and solve the following system of equations using Gauss - Jacobi method **07**

$3x + 20y - z = -18,\ \ 2x - 3y + 20z = 25,\ \ 20x + y - 2z = 17$

**Q.5** **(a)** Find the first four moments of the following data about assumed mean 25 and actual mean. **07**

| Class limit | 0-10 | 10-20 | 20-30 | 30-40 |
|---|---|---|---|---|
| Frequency | 1 | 3 | 4 | 2 |

**(b)** Find the correlation coefficient from the following data **07**

| X | 307 | 259 | 341 | 317 | 274 | 416 | 267 | 320 | 274 | 336 |
|---|---|---|---|---|---|---|---|---|---|---|
| Y | 80 | 75 | 90 | 74 | 75 | 110 | 70 | 85 | 88 | 78 |

**OR**

**Q.5** **(a)** Find both Regression lines for the data **07**

| | x | y |
|---|---|---|
| Mean | 60 | 67.5 |
| Standard Deviation | 15 | 13.5 |

The correlation coefficient is 0.5

**(b)** Calculate 7-yearly moving averages for the following data showing the number of students of an engineering college clearing GATE **07**

| Year | Number of students | Year | Number of students |
|---|---|---|---|
| 1999 | 23 | 2007 | 9 |
| 2000 | 26 | 2008 | 13 |
| 2001 | 28 | 2009 | 11 |
| 2002 | 32 | 2010 | 14 |
| 2003 | 20 | 2011 | 12 |
| 2004 | 12 | 2012 | 9 |
| 2005 | 12 | 2013 | 3 |
| 2006 | 10 | 2014 | 1 |

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